



MICROCOMPUTER USER'S LIBRARY SUBMITTAL FORM

28

Ref. No. BB10

☐ 4004 ☐ 8008 ☒ 8080

(use additional sheets if necessary)

Program
Title

BINARY TO BCD CONVERSION ROUTINE

Function

Converts binary value (1-24 bits) to its BCD value (1-8 digits)

Required
Hardware

NONE

Required
Software

NONE

Input
Parameters

H and L registers pointing to Most Significant BCD digits buffer
D and E registers pointing to Least Significant byte of binary value
A register has the number of bits to be converted.

Output
Results

H and L registers pointing to Most Significant BCD digit buffer

Registers Modified:	Maximum Subroutine Nesting Level:
All but H,L and D,E	1
RAM Required:	Assembler/Compiler Used:
3 bytes	MAC80
ROM Required:	Programmer:
176 bytes	Chon Hock Leow Tektronix
	Company:
	Box 500, Dept. 50-447 Beaverton, Oregon 97077

REF NO. BB10
PROGRAM NAME BIN TO BCD ROUTINE

BINARY TO BCD ROUTINE

ON ENTERING THIS PROGRAM
HL REG POINTS TO MS BCD DIGIT BUFFER
(DS=8 FOR MAXIMUM CASE I E. 24 BITS)
DE REG POINTS TO LS BYTE OF BINARY VALUE
A REG HAS THE NUMBER OF BITS TO BE CONVERTED

ON EXIT
HL REG POINTERS TO MS BCD DIGIT BUFFER
NOTE: 1 BCD DIGIT PER BYTE FOR EASY CONVERSION TO ASCII
EG. A REG.=10 -> BCD BUFFER NEEDS ONLY 4 BYTES

IF BINARY VALUE IS 0, BCD BUFFER IS NOT CLEARED

0010	SEIN	EQU	10H	ADDRESS FOR SAVING DE REG
0012	NEIT	EQU	12H	NUMBER OF BITS SAVED LOCATION
0200		ORG	200H	
		CSEG		
	BINBCD			
0200 321200	STA	NEIT	SAVE NUMBER OF BITS FOR CONVERSION	
0203 05	PUSH	D	SAVE DE POINTER FOR LSB OF BINARY	
0204 E5	PUSH	H	SAVE HL POINTER FOR MS BCD	
0205 EB	XCHG			
0206 221000	SHLD	SEIN	SAVE BIN POINTER FOR DIGIT ROUTINE USAGE	
TEST IF BINARY VALUE IS ZERO				
0209 AF	XRA	A	CLEAR A REG	
020A 7E	MOV	A,M	PICK UP LS BYTE	
020B 2B	DCX	H		
020C 8E	ADC	M	ADD IN NEXT HIGHER BYTE	
020D 2B	DCX	H		
020E 8E	ADC	M	ADD IN MS BYTE	
020F 0A7F02	JZ	EXIT	IF BINARY VALUE = 0 -> EXIT	

BINARY

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2000 FE          XCHG          ;RESTORE BCD POINTER
2001 M1200      LDA          NBIT ;PICK UP NUMBER OF BITS OF CONVERSION
2002 FE18      CPI          24    ;2**24 = 1 6777216 * 10**7
2003 M1300      JZ          TEN7
2004 FE12      CPI          18    ;2**18 = 2 62144 * 10**5
2005 M1400      JNC         TEN6  ;NO CARRY => G.T. 2**18
2006 FE0F      CPI          15    ;2**15 = 3 2768 * 10**4
2007 M1400      JNC         TEN5  ;NO CARRY => G.T. 2**15
2008 FE0C      CPI          12    ;2**12 = 4 096 * 10**3
2009 M1500      JNC         TEN4  ;NO CARRY => G.T. 2**12
2010 FE08      CPI          8
2011 M1500      JNC         TEN3
2012 FE06      CPI          6
2013 M1600      JNC         TEN2
2014 FE03      CPI          3
2015 M1600      JNC         TEN1
2016 M1700      JMP         TEN0  ;REACHED IF NBIT <= 0

      ; BEGIN CONVERSION
2017 1698      TEN7: MVI      D,98H ;989680H = 10**7
2018 018096    LXI      B,9680H
2019 CD8202    CALL     DIGIT
2020 160F      TEN6: MVI      D,0FH ;0F4240H = 10**6
2021 014042    LXI      B,4240H
2022 CD8202    CALL     DIGIT
2023 1601      TEN5: MVI      D,1   ;0186A0H = 10**5
2024 01A086    LXI      B,86A0H
2025 CD8202    CALL     DIGIT
2026 1600      TEN4: MVI      D,0
2027 011007    LXI      B,1000H
2028 CD8202    CALL     DIGIT
2029 1600      TEN3: MVI      D,0
2030 01E803    LXI      B,1800H
2031 CD8202    CALL     DIGIT
2032 1600      TEN2: MVI      D,0
2033 016400    LXI      B,140H
2034 CD8202    CALL     DIGIT
2035 1600      TEN1: MVI      D,0
2036 010A00    LXI      B,10H
2037 CD8202    CALL     DIGIT
2038 1600      TEN0: MVI      D,0
2039 010100    LXI      B,1
2040 CD8202    CALL     DIGIT
2041 CD7F00    JMP         EXIT

EXIT:
2042 FE1       POP         H      ;RETURN HL POINTING TO DS BCD
2043 FE0       POP         D      ;RETURN DE POINTING TO LSP OF BINARY
2044 FE0       RET

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SUBTRACTION ROUTINE

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DIGIT:
0282 1600 MVI M,0 ; INITIALIZE DIGIT
0283 7E ; FOR BCD, DIGIT=0
0284 E5 ; FOR ASCII, DIGIT=30H
0285 2A1000 PUSH H ; SAVE BCD POINTER
0286 7E SUB1: LHL SBIN ; PICK UP BIN POINTER
0287 91 MOV A,M ; PICK UP LS BYTE
0288 77 SUB C ;
0289 77 MOV M,A ; PUTS IT BACK
0290 2B DCX H ; POINTS TO 2ND LS BYTE
0291 7E MOV A,M ;
0292 98 SBB B ;
0293 77 MOV M,A ;
0294 2B DCX H ; POINTS TO MS BYTE
0295 7E MOV A,M ;
0296 9A SBB D ;
0297 77 MOV M,A ;
0298 7A MOV A,D ; SAVE D REG.
0299 DA9E02 JC RSTR ; IF CARRY RESTORE
029A E1 POP H ; PICK BCD POINTER
029B 34 INR M ; INCREMENT BCD POINTER
029C E5 PUSH H ; SAVE BCD POINTER
029D 57 MOV D,A ; RESTORE D REG.
029E C38502 JMP SUB1
    
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RESTORE ROUTINE

RSTR:

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029E 57 MOV D,A ; RESTORE D REG.
029F 2A1000 LHL SBIN ; PICK UP BIN POINTER
02A0 7E MOV A,M ;
02A1 81 ADD C ;
02A2 77 MOV M,A ;
02A3 2B DCX H ; POINTS TO 2ND LS BYTE
02A4 7E MOV A,M ;
02A5 88 ADC B ;
02A6 77 MOV M,A ;
02A7 2B DCX H ;
02A8 7E MOV A,M ; PICKS UP MS BYTE
02A9 8A ADC D ;
02AA 77 MOV M,A ;
02AB E1 POP H ; PICKS UP BCD POINTER
02AC 23 INX H ; POINTS TO NEXT BCD DIGIT
02AD C9 RET
02AE 0000 END
    
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SBIN: DS 2

WDIT: DS 1

BINUTP: XRA A
 MVI B,4
 LOOP3: STA X D
 DCX B

; address for saving D, E reg
 ; number of bits saved location
 ; store d's in BCD locs
 ; 4 BCD locations